IN THE TITLE:

(Currently amended) FABRICATION OF AN ARTICLE HAVING A THERMAL BARRIER COATING SYSTEM INCLUDING A PRE-OXIDIZED BOND COAT, AND THE ARTICLE

IN THE SPECIFICATION:

[0019] (Currently amended) A most preferred alloy composition is ~~Rene' N5~~ RENE™ N5, which has a nominal composition in weight percent of about 7.5 percent cobalt, about 7 percent chromium, about 6.2 percent aluminum, about 6.5 percent tantalum, about 5 percent tungsten, about 1.5 percent molybdenum, about 3 percent rhenium, about 0.05 percent carbon, about 0.004 percent boron, about 0.15 percent hafnium, up to about 0.01 percent yttrium, balance nickel and incidental impurities. Other operable superalloys include, for example, ~~Rene' N6~~ RENE™ N6, which has a nominal composition in weight percent of about 12.5 percent cobalt, about 4.2 percent chromium, about 1.4 percent molybdenum, about 5.75 percent tungsten, about 5.4 percent rhenium, about 7.2 percent tantalum, about 5.75 percent aluminum, about 0.15 percent hafnium, about 0.05 percent carbon, about 0.004 percent boron, about 0.01 percent yttrium, balance nickel and incidental impurities; ~~Rene' 142~~ RENE™ 142, which has a nominal composition, in weight percent, of about 12 percent cobalt, about 6.8 percent chromium, about 1.5 percent molybdenum, about 4.9 percent tungsten, about 6.4 percent tantalum, about 6.2 percent aluminum, about 2.8 percent rhenium, about 1.5 percent hafnium, about 0.1 percent carbon, about 0.015 percent boron, balance nickel and incidental impurities; ~~CMSX-4~~ CMSX™-4, which has a nominal composition in weight percent of about 9.60 percent cobalt, about 6.6 percent chromium, about 0.60 percent molybdenum, about 6.4 percent tungsten, about 3.0 percent rhenium, about 6.5 percent tantalum, about 5.6 percent aluminum, about 1.0 percent titanium, about 0.10 percent hafnium, balance nickel and incidental ~~impurities;~~ ~~CMSX-10~~ CMSX™-10, which has a nominal composition in weight percent of about 7.00 percent cobalt, about 2.65 percent chromium, about 0.60 percent molybdenum, about 6.40 percent tungsten, about 5.50 percent rhenium, about 7.5 percent tantalum, about 5.80 percent aluminum, about 0.80 percent titanium, about 0.06 percent hafnium,

about 0.4 percent niobium, balance nickel and incidental impurities; ~~PWA1480~~ PWA™1480, which has a nominal composition in weight percent of about 5.00 percent cobalt, about 10.0 percent chromium, about 4.00 percent tungsten, about 12.0 percent tantalum, about 5.00 percent aluminum, about 1.5 percent titanium, balance nickel and incidental impurities; ~~PWA1484~~ PWA™1484, which has a nominal composition in weight percent of about 10.00 percent cobalt, about 5.00 percent chromium, about 2.00 percent molybdenum, about 6.00 percent tungsten, about 3.00 percent rhenium, about 8.70 percent tantalum, about 5.60 percent aluminum, about 0.10 percent hafnium, balance nickel and incidental impurities; and ~~MX-4~~ MX™-4, which has a nominal composition as set forth in US Patent 5,482,789, in weight percent, of from about 0.4 to about 6.5 percent ruthenium, from about 4.5 to about 5.75 percent rhenium, from about 5.8 to about 10.7 percent tantalum, from about 4.25 to about 17.0 percent cobalt, from 0 to about 0.05 percent hafnium, from 0 to about 0.06 percent carbon, from 0 to about 0.01 percent boron, from 0 to about 0.02 percent yttrium, from about 0.9 to about 2.0 percent molybdenum, from about 1.25 to about 6.0 percent chromium, from 0 to about 1.0 percent niobium, from about 5.0 to about 6.6 percent aluminum, from 0 to about 1.0 percent titanium, from about 3.0 to about 7.5 percent tungsten, and wherein the sum of molybdenum plus chromium plus niobium is from about 2.15 to about 9.0 percent, and wherein the sum of aluminum plus titanium plus tungsten is from about 8.0 to about 15.1 percent, balance nickel and incidental impurities. The use of the present invention is not limited to these preferred alloys, and has broader applicability.

[0024] (Currently amended) To form the desired alumina scale 44, the partial pressure of oxygen is preferably between about 10^{-5} mbar (millibar) and about 10^{3} mbar, more preferably between about 10^{-5} mbar and about 10^{-2} ~~mbar,~~ mbar. Most preferably, the partial pressure of about 10^{-4} mbar, which produces the best thermal fatigue life in furnace cycle testing. The pre-oxidation step 66 is performed without combustion gas or other sources of corrodants present, which otherwise interfere with the formation of

the desired high-purity alumina scale 44. The pre-oxidation temperature is preferably from about 1800°F to about 2100°F, most preferably from about 2000°F to about 2100°F. The higher pre-oxidation temperatures are preferred to favor the formation of alpha alumina, but the indicated maximum temperature may not be exceeded due to the potential for damage of the superalloy substrate. The article to be pre-oxidized is desirably heated from room temperature to the pre-oxidation temperature in about 45 minutes or less, more preferably from about 15 to about 35 minutes. If the heating is too slow, there is an opportunity for the formation of detrimental, less adherent, oxide phases within the alumina scale 44. The adherence of the alumina scale 44 to the protective coating is therefore reduced. The time at the pre-oxidizing temperature is preferably from about 1/2 hour to about 3 hours, to achieve a pure alumina scale 44 having a thickness of from about 0.1 micrometer to about 1 micrometer.

IN THE DRAWINGS

Applicant submits herewith, new drawings with changes suggested by the Examiner.